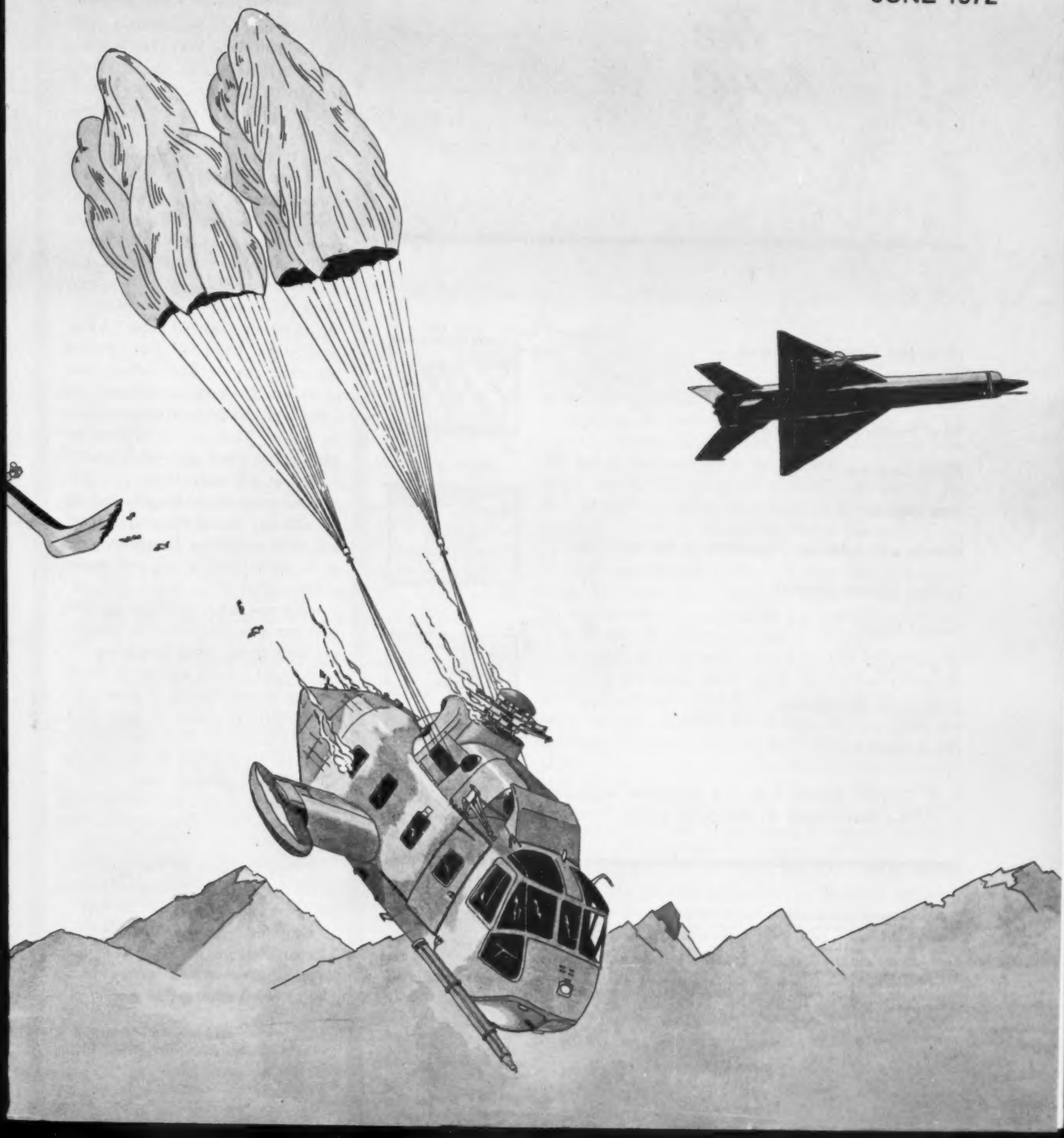
The MAC Flyer

JUNE 1972



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For Greater Efficiency
in MAC Air Operations

The MAC Flyer

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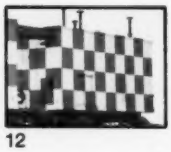
JUNE 1972 MAC RP 127-5 VOL XIX, NO. 6

Helicopter Egress Is Possible 3
Put a Little Color in Your Weather 8
What Happened to Daedalus? 11
Radar Displays 12
Dear Doc 15
Mishap with a Moral: Epidemic of Apathy .. 16
Writing Contest Winners 21
Project MAST 22
C. R. Terror 24
A Very Uneven Contest 26
Quick Stoppers 28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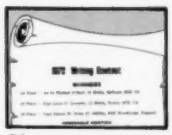
21

22

COVER: Bailing out of a helicopter is chancy at best. For one man's views on helicopter egress, check the lead article.

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Squawk Box

Well, here 'tis: Squawk Box number six. This series was begun as an attempt to have a true editorial — a friendly visit or a bit of pulpit pounding — from one of the editors. It also offered a chance for you to share your ideas through us; as we said in the first column, we hoped to open a communication line upward from the man at the bottom. Thanks to some common-sense bosses, we were given a nice ration of editorial latitude, too.

Now, some six months later, we'll share the comments of Mr. John C. Quinn from Associated Press: "A sage gent once observed that writing editorials can be like wetting your pants in a blue serge suit. It gives you a nice warm feeling and no one seems to notice." True; yet we have always enjoyed the chats with other editors — *Driver, Changing Times,* and *Airman* for example. So we plan to keep on with our side of the conversation, and hope you chime in whenever we raise an interesting or challenging point.

And now, a few kudos for you who have put some extra effort in supporting your flying safety magazine:

* Thanks to the authors of the 24 writing contest entries. (The winners are proudly presented on page 21).

* Thanks to Norton's Captain Kirkland for the idea we used in the C. R. Terror yarn for May.

* Thanks to you who mailed us a bit of verse or a drawing we could use.

* And thanks to all who took time to fill out a Reader Response form — we hope to have a report in July.

One more quote: as one of baseball's greats, Mr. Y. Berra, said, "You can observe a lot just by watching." Keep watching this space.

Helicopter Egress Is Possible

by Maj Jerry Preston
MAC/IGYF

"Podunk tower, Hotel 37 is ready for takeoff."

"Roger, Hotel 37, surface winds 340 at 3 ... cleared for takeoff."

With that, an Air Force helicopter rose to a hover, lowered its nose, and departed. Aboard were two men: the pilot, an Air Force major, and one enlisted crewmember. Moments after takeoff, the pilot called for clearance to cross the active runway. It was quickly granted, and soon the pilot reported clear. Thirty-six seconds later, Podunk tower received the following transmission:

"Mayday, Mayday! 37 ... 37 ... Lost my tail rotor ... 37."

Before the stunned tower operator could do anything to assist the pilot, there was one final radio call from Hotel 37. It stated simply: "This is it!"

Seconds later the ill-fated helicopter slammed into the ground, instantly killing both crewmembers. The flight had lasted only 5 minutes and 30 seconds.

Investigators found that the helicopter's tail rotor yoke had failed, throwing the tail rotor into the main rotor system. The main rotor had then separated from the aircraft and severed the tail pylon. In a split second the helicopter had turned into a viciously tumbling mass of men and metal from which there could be no escape. Not this time.

The tragedy of Hotel 37 was painfully typical of many helicopter accidents caused by inflight fires or rotor system break-ups. But there is a possibility that these men need not have died. Investigators established that 19 seconds elapsed between the first mayday call and the pilot's last transmission. Witnesses saw the aircraft at least 500 feet above the ground when the emergency occurred. There was enough time and altitude available for the crewmembers to have escaped — *if* the aircraft had been equipped with an escape system. But it was not!

I would like to be able to say that the tragedy of Hotel 37 could never happen again. As a safety officer, it is part of my job to learn from accidents like this and to see they are not repeated. But in this case I'm forced to admit that it could happen again tomorrow.

No, the tail rotor yoke on the type of helicopter involved should never break again. We have modified the hardware to prevent that. But if a main rotor head should fail, if an uncontrollable fire should occur in flight, if a helicopter should be involved in a mid-air collision, the crew will have no more chance of escape from their crippled aircraft than the crew of Hotel 37 did — virtually none. The unvarnished truth is that we're still building helicopters with little or no regard for aircrew escape in the event of an inflight emergency.

For example, the UH-1 Huey, the newest single-engine helicopter in the Air Force inventory, has seats that were designed to be used without parachutes. Back pack chutes can be worn in these seats, but the chute forces the crewmember to sit on the very forward portion of the seat cushion. This is not only uncomfortable, but can actually affect the pilot's control of the aircraft and even com-

JAGGED ROCKS and other terrain features can make surviving an autorotation a matter of luck. All too often, the crew has no other choice.

promise the structural integrity of the seat itself!

The proposed AM-56A Cheyenne is a classic example of our present attitudes toward helicopter escape systems. This single engine aircraft, which will cruise at better than 230 knots and weigh nearly 25,000 pounds, was specifically designed to be used as a gun-ship in combat — but an aircrew escape system was not even considered in the design proposal!

I submit that the inflight protection for crewmembers and passengers in today's rotary winged aircraft is totally inadequate. I would like to explain why this situation exists and what hope there is for the future.

Present Attitudes

Early in the history of aviation it became apparent that some way to escape from disabled aircraft in flight had to be devised. Parachutes were borrowed from balloonists and adapted for use in airplanes. Fixed wing escape systems were enthusiastically received and were soon considered a vital necessity in many aircraft. Through the years, these systems have kept pace with improved aircraft performance, progressing from the crude early personal parachutes to the sophisticated escape modules in aircraft like the F-111.

But unfortunately, helicopter escape systems have not advanced. The personal parachute — the first attempt at a helicopter escape system — is still the only method of inflight escape from rotary wing aircraft. This "developmental stagnation," I believe, is due to several factors which I'd like to discuss.

Autorotation: This has probably been the biggest single obstacle to helicopter escape system development. Because of this unique helicopter characteristic, pilots have developed a great deal of confidence in their ability to autorotate out of trouble. Unfortunately, this confidence is often unfounded.

A successful autorotation actually depends on these unrelated factors:

* Pilot response and training
* Aircraft altitude and airspeed at the time of failure
* Aircraft autorotational characteristics
* Nature of the mechanical failure
* Terrain available for landing
* Weather conditions at the time of failure

All six of these factors must be favorable to guarantee a successful autorotation. If any one is less than optimum, the chances of success are decreased. For example, if the aircraft is operating in weather, at night, and over rugged terrain, the chances of a successful autorotation are slim. If the emergency is caused by a massive failure in the main rotor head, the chances of a successful autorotation are non-existent.

We must admit to ourselves that autorotation may be the best primary method of dealing with inflight helicopter emergencies, but it is woefully inadequate as the only method.

Manual Bailout: This option has been offered as a helicopter escape system, but most helicopter pilots — justifiably — regard it with contempt. Parachutes are seldom worn in helicopters except by directive. Helicopter pilots know that a manual bailout is extremely hazardous, and the lack of successful bailout statistics prompts them to conclude that, no matter what happens, they are going to stick with the aircraft.

About the Author

Major Preston graduated from pilot training in March 1958 and was immediately assigned to helicopters at Randolph AFB, TX. He has flown fling wings ever since, except for two brief periods when he flew U-3s and T-29s. Through the years he's flown the H-13, H-19, H-21, H-34, HH-43, H-1, and H-3. He's also flown such unusual helicopters as the Cessna Skyhook, the French Alouette, the Bell Ranger, and the Sikorsky S-62. A flying safety officer since 1965, Major Preston has 4,200 flying hours, 3,300 hours in helicopters and 2,500 hours as a helicopter instructor. Since August 1971 he has served as a helicopter flying safety officer at Headquarters MAC.

Mr. Robert S. Decker, chief of the pilot's branch at Sikorsky Aircraft, summed it up this way:

> *"The average helicopter, stick free and without stability augmentation, is much less stable than a fixed wing aircraft and, at best, presents a poor platform for exiting. Under emergency conditions, this poor platform can deteriorate into a completely uncontrollable mass. The rotor discs are potential buzz saws waiting to chew up anything that might get into their path; therefore, it becomes increasingly difficult to bail out safely in an uncoordinated roll and virtually impossible in an inverted position."*

I agree that the chances of surviving a manual bailout from an uncontrollable helicopter are very slim — but they are better than nothing. Despite its inadequacies, we cannot discount the manual bailout procedure yet: not as long as it is the only method of inflight escape available.

Escape System Design Assumptions: Until recently, many design engineers felt that the complications presented by helicopter rotor systems would make any possible escape system too complex and heavy to be practical. They believed that the cost and weight of an escape system couldn't be justified for an aircraft which could, in most cases, safely autorotate.

Fortunately, spurred by recent advances in technology, these attitudes are beginning to change and new efforts, which we'll discuss later, are being extended to develop a reliable, lightweight helicopter escape system.

Accident Experience: Many people believe that few helicopter casualties result from emergencies during which an inflight escape system could have been used. However, a careful analysis of helicopter accident data proves this is simply not true. A study was made of all U.S. Navy helicopter accidents from 1952 to 1965 and all U.S. Army helicopter accidents from 1958 to 1965. This included 213 accidents with 571 fatalities The study concluded that of these fatalities, 276 — nearly 50 percent — resulted from situations in which the crew could have bailed out — *if* they had had a suitable escape system.

There can be no doubt of the need for such a system.

Change — But Slowly

In recent years, some efforts have been made toward developing escape systems for helicopter crews and passengers. So far, most of this effort has been confined to theoretical discussions with a few limited tests by independent designers or engineering firms. Military participation has been mainly passive; the services do not yet seem ready to spend money on helicopter escape systems. In spite of the lack of funds available, several interesting concepts for helicopter escape systems have evolved.

A *downward ejection seat* in a helicopter would eliminate any interference with the main rotor by sending the crewman the other way. However, considering the extremely low altitudes of most helicopter missions, and the downward seat's relative lack of success in fixed wing aircraft, this idea cannot be considered too promising.

An *upward ejection seat, fired through the main rotor,* has been considered. The seat would be timed to pass between the rotor blades much the same as synchronized machine gun bullets are timed to go between propeller

A COMBAT CHOPPER, the HH-53 offers only autorotation or personnel parachutes in case of trouble.

SURVIVABLE — IF WE HAD CARED. When this HH-43 became uncontrollable, there was time and altitude enough for the crew to have bailed out — if the aircraft had been equipped with an escape system. It wasn't.

blades. Technically, this system may be possible but it would be complicated, and partial failures — such as a timer failure — could be disastrous. Also, the acceleration forces necessary to get the seat and man through the rotor quickly enough may be excessively high. This is another idea that does not appear too promising at this time.

A *vertical ejection seat,* combined with *an explosive system to remove the main rotor,* is another possibility. This system would use a standard ejection seat like the ones found in fixed wing aircraft. During the initial portion of the ejection sequence, obstructions such as the roof of the cabin and the main rotor would be ballistically removed — blown off.

One big advantage of upward ejection is that the system could use a great deal of existing hardware. The biggest disadvantage seems to be weight. The ejection seat, catapult, and guard rails would be much heavier than a standard helicopter seat, and the airframe structure would have to be reenforced to withstand a catapult recoil force of several thousand pounds.

Another possible objection to this system is that the severed rotor blades could become unguided missiles and pose a serious threat to other aircraft in the vicinity. We'll discuss a possible solution to this problem later.

A *combination lateral/vertical ejection* has been proposed. With this system the ejection seat would be fired out of the helicopter sideways far enough to clear the rotor blades, and then upward, by another charge, high enough for the parachute to open. About the best that can be said of this system is that at least it saves blowing off the rotor.

The system would weigh as much or more than a vertical ejection system and would also pose interesting problems in seat stability when the second rocket fired. High lateral forces would make adequate restraint of the crewman difficult, but this could be eliminated by rotating the seat 90 degrees to the left or right before it is fired. (Yes, this has actually been proposed.) A lateral ejection, close to the ground, on the low side of a steeply banked aircraft, would offer little chance of success.

A *vertical extraction* (not ejection) *after severing the rotor blades* is one of the most promising concepts proposed so far. Basically, it employs the Yankee extraction system originally developed by Stanley Aviation Corporation in the early '60s and used with great success in some fixed wing aircraft. With the Yankee system, the crewman is pulled out of the aircraft by a tractor rocket and pendant line connected to his parachute harness. The seat, usually a modification of the original seat, stays in the aircraft, and the rocket automatically stabilizes the man and eliminates tumbling, which is a common problem with ejection seats. Since the rocket's force is applied to the crewman through his parachute harness instead of the seat, there is much less danger of back injury during egress. The tractor rocket is aerodynamically designed so that, regardless of its attitude when fired, it will always go up — even turning if necessary. Indications are that this system will provide safe recovery with pitch or bank angles of up to 45 degrees, with the aircraft at ground level, and at any speed from zero to well over 200 knots.

The vertical extraction system still requires some means of getting rid of the main rotor blades. Earlier, I mentioned the objection that blades blown off during the

egress cycle could become a hazard to other aircraft nearby. One aircraft shedding blades in the middle of a helicopter formation could be a nightmare; however, there seems to be a solution. Limited tests have already been run on a sequenced blade separation system. With this system, the blades are severed at specific points during rotation and thrown off in accurately predetermined directions. For example, the blades could be set so they will go straight forward or to the rear of the aircraft. Once the blade paths have been determined, helicopter formation positions could be adjusted to avoid the danger areas.

A *lateral extraction*, using the Yankee system to pull a pilot out the side of the aircraft far enough to clear the rotor disc, has also been proposed. This would eliminate the need to remove the rotor blades but, as with the lateral ejection, could impose excessive lateral forces on the crewman during escape and would not work at low altitudes unless the aircraft's bank angle was near zero.

So far we've limited this discussion to systems designed to remove individual crewmembers from a disabled helicopter, but there is another concept, *encapsulation*, which is probably the most ambitious and spectacular idea tested so far. This system, developed for the Navy by Boeing Vertol, converts the cabin of the aircraft into an escape capsule by blowing off the rotor systems and unnecessary portions of the airframe and triggering quick opening parachutes. These parachutes are deployed and spread ballistically and will open completely even in static conditions. Once the chutes are out, the capsule descends at 25 to 40 feet per second. Shock absorbing features would be built into the capsule and seats to reduce landing loads. Tests have shown that a safe recovery could be made with this system from altitudes as low as 100 feet above the ground.

The encapsulated system would be heavy so it would be most adaptable to large helicopters — precisely the type of aircraft which most need this sort of system. A whole cabin full of passengers could be safely recovered while they merely remained seated and strapped in until the capsule landed.

The Future

I believe helicopter escape systems are within the present state-of-the-art of aircraft design. But due to a discouraging lack of interest, the systems I've described are hung up in development; some exist only on paper and have never been tested.

This deplorable situation must not be allowed to persist. The isolated current attempts to develop helicopter escape systems must be supported and encouraged until the concepts become hardware. The military must acknowledge the urgency of the need and accept the challenge of developing a solution. That does not mean mere lip service. It means abandoning our wait-and-see policy in favor of supporting helicopter escape system development with work and cold hard cash. The time is now. We've waited long enough.

I feel it is totally illogical for us to spend hundreds of thousands of dollars on an escape capsule to recover two pilots from a jet aircraft, while we would unhesitantly send those same two men into combat in a rotary wing aircraft with no escape system at all.

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ONCE UPON A TIME THERE was an official edict which said something like this: "Thou shan't fly thy airplane into a weatherman's black area." The reason? Back then airplanes milled along blindly (without radar) at 10,000 feet or so, and a black area was a place where tornados and thunderstorms were raising cain with anything not firmly tied down. Though both the edict and that particular use of color have passed into history, the concept has remained — among pilots, who are rightfully awed by funnels, big buildups, and anything hinting at same, and among some forecasters, who match their new multi-hued weather warning map with a touch of memory and offer "don't fly" advice at the drop of a 175-1.

This situation was brought to a head some time ago when the forecasters for a unit undergoing an ORI took a very firm position. The chief briefer waved his weather warning fax map under the nose of the wing ops honcho and a Key Inspector (with a Capital I) and said — "You're going to be flying in a red area."

"Call off the ORI — we can't fly missions in a red area," said the operator.

Quoth the inspector, "Plz show me where it says in writing you can't fly through a red area."

"Hmmmmmmmmm," said the forecaster.

"Gulp," said the ops chief.

"Zap," said the inspector.

Obviously, a measure of confusion or misunderstanding exists about what those color boxes on weather maps mean, and about what you as a MAC aviator can do in a color box area. To clarify the basic item — the color box concept — we called Mr. Robert C. Miller, Chief Scientist of Air Force Global Weather Central (AFGWC) at Offutt, who is an experienced, retired military severe weather forecaster. He recapped the severe convective weather code areas as follows:

If you can tell us what's red on the inside, blue on the outside, and fringed by patches of orange, you're either a weather expert or an unusually astute pilot. If you draw a blank, now's the time to . . . .

Red area: An area with a potential for tornados and severe thunderstorms. Criteria include winds of 50 knots or greater, and hail of 3/4 inch or larger.

Blue area: Severe thunderstorms (again with 50-knot or better winds and hail 3/4 inch and up), typically with locally damaging winds 60-65 knots.

Orange area (first category); Thunderstorms of less intensity than in red or blue areas. Winds of 35-49 knots, hail 1/2 inch or smaller.

Orange area (second category): Thunderstorms with gusts of less than 35 knots.

While we're on the subject, there are three other colors used to flag severe but non-convective weather activity. These are:

Black area: Surface wind hazard without any thunderstorms; winds expected to be 35 knots or greater. Most of the black area winds just make it into the 35-40 knot zone, though this category also includes hurricanes with their 90-110 knot blasts.

Brown area: Freezing precipitation at the surface.

Purple area: Heavy precipitation forecast, either rain or snow. In either kind, according to our friendly forecaster, two inches or more in 12 hours qualifies as "heavy."

Three more points worth noting:

*In all areas the specifics of the forecast will be spelled out.

*Severe weather zones can include more than one color.

*And here's a memory device to help keep your colors straight—

Red is the roughest,
Though blue can be beastly,

Put a Little Color in Your Weather

While orange is only
Of these three the leastly.

"Yes," you agree, "that's nice to know — but what's the practical application for me? I've got to get my airplane from here at Ivory Tower International to Boonieville, and there's a big blue area in the way."

First, let us present a few more details, then we'll answer your question.

These color boxes, or severe weather forecast areas, are produced by the experts and the AFGWC computer at Offutt. The term "color box" dates to the old days, when severe weather forecasts were expressed in terms of "fifty miles either side of a line extending from Hooterville to Mount Idy," and the resulting design was box-like. The boxes are now quite oddly shaped but far more accurate, and are published in two ways.

First, the old form, more properly known as the military weather advisory or MWA. It resembles an eight-by-ten piece of teletype paper covered with letter patterns. The weatherman carefully draws lines around the various letter areas, adds color shading, reads the warning details from the accompanying text, and uses an acetate US-map overlay to match the warning areas to the geographical locations.

Second, the new form, first produced on 4 Dec 1970, is a bigger facsimile map presenting the same MWA data. This map, which the weatherman quickly dresses up with a touch of color and then displays on the wall, contains the specific forecasts written in or immediately adjacent to the affected area, and is easily read by both weatherman and aviator.

The fax maps are assembled and transmitted four times each day, beginning at 0201Z, and are good for 12 hours, beginning approximately an hour after transmission time. The warning areas identified on the maps may be modified at any time by follow-up message, and they may also be valid for less than the whole period.

Now comes a very important point: *these weather warning areas are advisories only.* They present, graphically, those areas where the computer and the ace weathermen supporting it predict conditions which are likely to develop which may produce severe weather. Note two things: the color box identifies an area of *probability,* and the weather predicated therein may have a stated time of expected occurrence *anytime* during the 12-hour forecast period.

"Okay, I'm with you," you offer. "A color box is a forecast area of hazard potential, and it may not include wall-to-wall bumpers. Now tell me what's this MIC and TAA stuff I've heard about?"

Fair enough; here are the definitions of these terms, which have only been with us a little over a year.

MIC is maximum instantaneous coverage, or the percentage of the area which will have the predicted weather at the time of maximum activity during the valid period. Typical values are as low as 1-3 percent, with an unusual situation involving 10 percent area coverage. According to Mr. Miller, you'll never see over 20 percent area coverage, and values approaching this are found only in very compact, slowly moving storm situations.

TAA is total area affected, or the percentage of the specific warning area which will experience the forecast thunderstorms at some time during the entire forecast period. Typical values may be anywhere from 10 to 60 percent; squall lines may cover 40-70 percent of an area if the

forecast zone is small enough. Incidentally, to have 100 percent of the area affected, all stations within the borders of the color box must report thunderstorms. Note: *both MIC and TAA apply only to areas of convective activity.*

The color box area shown must reflect the movement of the weather hazard for the entire forecast period. With the speed of a hot squall line typically 35 knots or so, over a 12-hour period such a line could cover an area 400 to 500 miles wide.

As you can see, in some cases you could fly in a color box without ever seeing a thunderstorm — if you were well away from the line or front. The risk is in flying through the actual cells, not through the areas of forecast. High altitude aircraft with extensive route alteration ability and good radar will have few problems, except perhaps in terminal areas and during letdown and climbout.

"Great. Now answer my big question: Can I fly through a red area?"

Yes. You *can* fly through a red, blue or any other area — but you might be well advised *not* to. Guidance from the good book is like this:

*MACSUP 1, AFM 60-16: "MAC aircraft will not be operated into known or forecast weather conditions (icing included) which will exceed aircraft limitations as given in the flight manual, nor will they be operated into areas of known or forecast thunderstorms without an operational airborne radar unless the weather forecast indicates that the IFR flight can be conducted through the area visually.

"Missions should be planned to circumnavigate areas of forecast severe clear air turbulence."

*The C-141 flight manual: "Flight through thunderstorms or other conditions of extreme turbulence must be avoided whenever possible."

The prohibitions are on flying through anything which your machine can't successfully negotiate: ice, turbulence, hail. These things are found in the severe weather *phenomena* themselves — *not* just in the forecast areas or color boxes. And how can you tell one from the other?

Step right up, Mr. Forecaster, please.

The job of your friend across the counter — the one with all the colored pencils and the red eyes — is to provide you with the guidance necessary to help you plan your flight. You make the decisions; he tells you what the weather is like and what he thinks it will *be* like at the times and places you select. The severe weather warning area map is just one of the tools in his bag of prognosticative devices. You and he must work together to develop the information you need, based on the timing of your mission, the actual positions and development of the weather in the areas, what phenomena the appropriate stations are reporting, and what the weather radar shows. The forecaster is the weather service field representative and salesman — he's got to take all the raw materials and build the product you need.

"Fine. I've got the message. I can fly in a red or blue or black area, *if* I can stay out of the rotten weather — or go through it safely. And it's sort of a team effort — I've got to work with the forecaster, and I've got to use all the materials at his disposal, not just the color box map and a shake of the head."

Friend, you *do* have the message. Now go ask someone else, "What's red on the inside, blue on the outside ...?"

by Maj R. L. Wing

What Happened to Daedalus?

IT IS WELL ESTABLISHED in the lore of ancient times that two early generation flyers, Daedalus and Icarus, made the first successful flight using wings of feathers and wax.

Also well known is the fact that the daring young Icarus flew too close to the sun, whereupon his wings came unglued and the aviator spun in — thus becoming the first fatality in the history of aviation. Daedalus, the cool and steady one, proceeded on to Sicily and thus escaped the wrath of King Minos of Crete.

The sequel to this tale is not generally so well known. After his safe arrival, Daedalus stashed his wings in a convenient barn and set up a counter-revolutionary plot. He became enmeshed in the logistics of his scheme and harassed by numerous minor details, and on top of it all his second wife objected to the time he was spending at the office.

Daedalus was an intelligent fellow, and he was well aware that his ancient enemy, Minos the Mean (there *was* a bad guy), was likely to chase after him to Sicily. So one day, he squeezed in a few minutes from his busy schedule and hauled out his old wings. Daedalus was going to be ready in case he had to beat a hasty retreat to the Riviera, which even in those days had a pretty good reputation among well-heeled people without a country.

Sad to relate, a feather tore loose from his right wing shortly after takeoff, partially destroying the lift. While Daedalus pondered this problem and tried to recall the proper corrective action, the condition worsened. Several more feathers worked loose and gently fluttered to the ground. Unsure of the loss of feather checklist, Daedalus quickly returned for an emergency landing. As has been proved several times since, he learned that winged objects do not fly so well with partial lift on one side. As he approached the flare, several more feathers tore loose. His wing dipped; he fought to bring it up with opposite wing and all the rudder he could muster. Gravity called and Daedy severely fractured his gluteous maximus.

Thus occurred the first recorded crash landing during the course of what is now referred to as proficiency or mission support flying.

Your aircraft transponder is a valuable aid to the ground controller. Let's look at . . .

Radar Displays

MILITARY AIRCRAFT have had IFF/SIF — transponders — for years. The earliest IFFs were originally used in WW II to identify our boys coming back across the English Channel. IFF wasn't very sophisticated in those days, just a black box with an off/on switch. It was pretty basic. It didn't take the Germans very long to figure out what we were doing, and they too installed their black boxes; thus a need for better equipment arose. Black boxes with several codes were then installed, giving us the capability to change our codes daily, confusing the enemy. This same principle of squawking different codes has grown to the sophisticated IFF/SIF we have today: the ability to squawk four-digit codes on mode three plus the capability of altitude readouts by some ground units. Today's crowded air traffic environment is made safer with the use of these transponders. Proof of the parrot's importance: the requirement for a transponder for all flights above FL 180.

Equipment

There have been great advancements in military and civilian airborne equipment and FAA ground equipment, but improvements in the military ground equipment have been slow. Today, most of our aircraft in MAC have or will soon have the 4096 code capability, but the primary USAF ground radar IFF/SIF gear consists of the UPX-8 or -9 SIF introduced in 1958 and the Mark X IFF, which was introduced in the 1940s. Presently, though, there are a few USAF flight facilities testing new computerized radar units. In the future, hopefully, all USAF radars will be updated.

With so much emphasis placed on radar control today, flight crews should know more about what radar does for a controller. We all know that he sees our aircraft as some kind of a blip, but what methods or capabilities does the controller have to interrogate our transponder and what does his display look like? (For now, we will discuss only the USAF controller's equipment. At some future date we will treat the FAA equipment and the new altitude readout capability.)

The -8 and -9 SIF radar display equipment are the mainstays of USAF flight facilities gear. The -8 and -9 have the same basic capability, and they both can display signals from your aircraft in several different ways. But each is limited to displaying only one code on mode 3 at a time. This is a very important factor to remember and will help explain why we should select both emergency and code 7700 for an emergency situation.

Emergency

Let's stop here to briefly discuss code 7700 and military emergency (Mayday) squawks. If we select code 7700 to indicate an emergency, the UPX-8 or -9 will merely lose our return, just as if we changed from code 2100 to 2200. When we select emergency, whatever code we are squawking will appear on the scope as four sets of our basic squawk (see figure 1; the different functions labeled Raw, Decode, and Assist will be explained in just a moment). However, this emergency squawk will appear only on a military scope. On an FAA scope, the display will not change and the FAA controller will not be aware of your emergency. Therefore, to alert an FAA controller we must select code 7700, which will ring an alarm at the FAA controller's scope and alert him to the emergency squawk.

(continued)

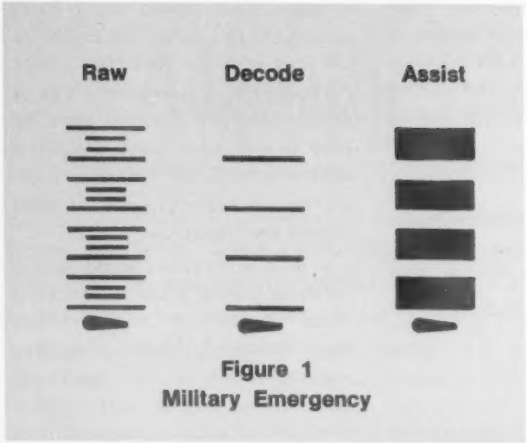


Figure 1
Military Emergency

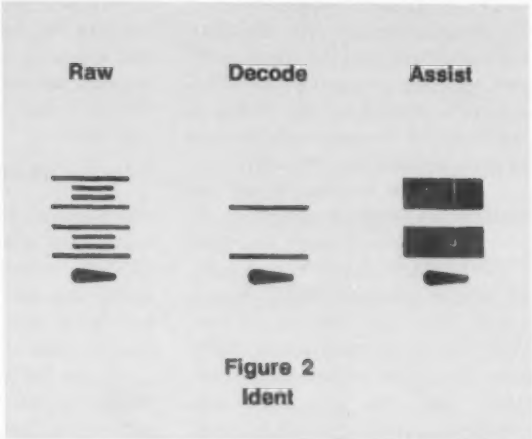


Figure 2
Ident

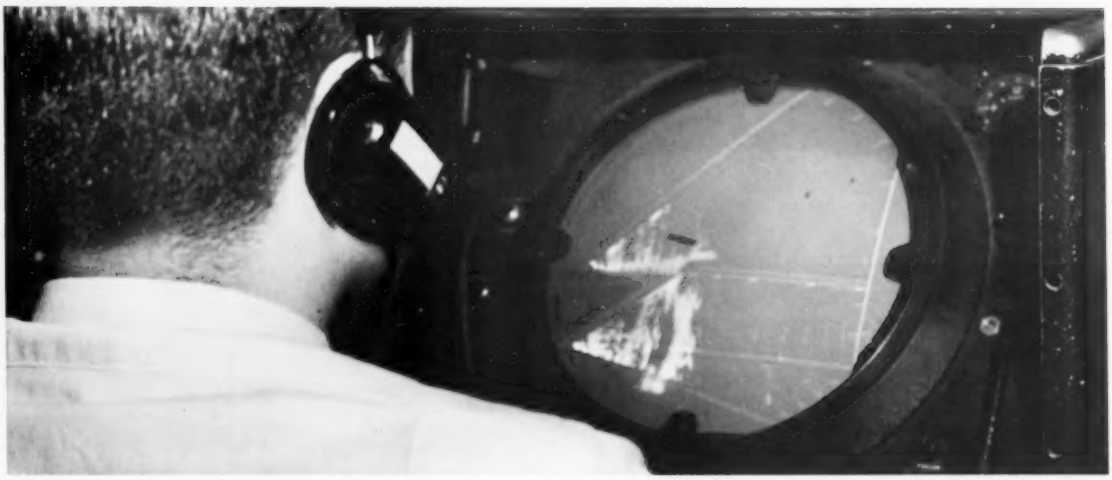


Figure 3
Beacon Off

Figure 4
Raw Video

Figure 5
Decode

Figure 6
Beacon Assist

We can see the wheels turning; you're saying this doesn't make sense. By changing to code 7700 the USAF controller will lose my return — by just selecting emergency, the FAA controller doesn't see any change in my squawk — the system doesn't seem to be complementary. We agree with you. This is the very reason why you *must* squawk 7700 and emergency. By selecting both, you assure that both FAA and USAF controllers are alerted to your problem. Here is how it works. Select code 7700 and you alert FAA, and your coded return disappears from the USAF scope. *But*, when you also select military emergency, your emergency mode will appear on the USAF controller's scope without him having to change his scope configuration and search codes 7700, 7600, and 3100 to see if you have a serious problem.

The other benefit of going to emergency is that your emergency squawk will be read by all military radars within range. You don't have to be in radio contact with a particular controlling agency. Your emergency squawk will be picked up by the basic Mark X IFF ground equipment.

Ident

The ident feature on the transponder helps the controller in maintaining positive identification. When identing, the code you are squawking will appear as two sets for 15 to 30 seconds (see figure 2). This enables the controller to positively identify your aircraft.

Display Methods

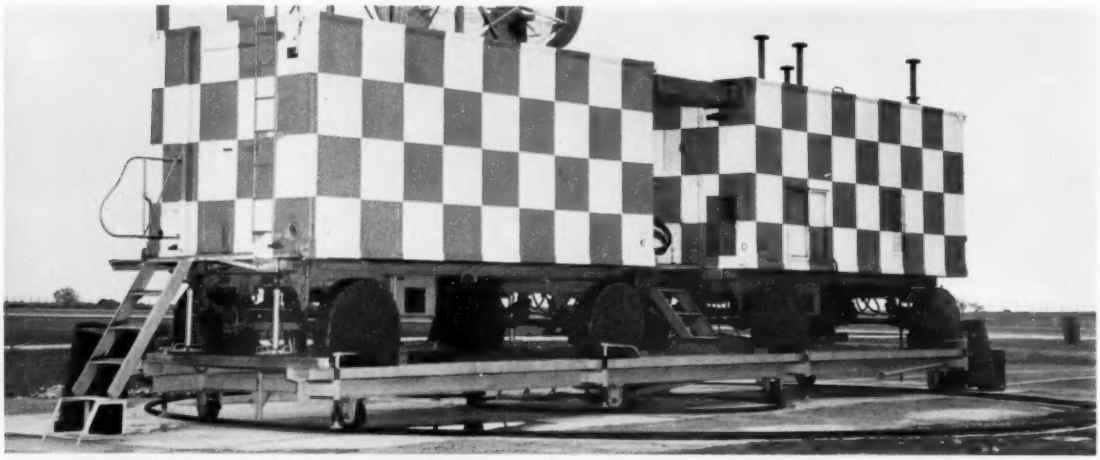
We said earlier that the controller could select several modes to display IFF/SIF returns. There are four modes that he uses to do this — Beacon Off, Raw Video, Decode, and Beacon Assist.

Beacon Off is used only to paint a primary or raw target. This is a skin paint of the airframe from reflected RF energy (see figure 3). This method is rarely used by itself unless interference is experienced with ground radar displays or malfunctioning airborne SIF/IFF equipment.

The Raw Video mode is selected and used when interrogating an aircraft with an operational transponder. This display consists of two bracketing slashes plus additional slashes whose relative position indicates the code selected by the aircraft (see figure 4). Raw Video is used to determine the code an unidentified aircraft is squawking or to assist in handing off your aircraft to another sector.

The Decode mode is displayed as a single slash behind the primary target of your aircraft and replies on the same code the controller selects. Aircraft replying on other codes or not transponder equipped show up only as a primary target. Decode is used when IFF/SIF returns are obscuring the primary return of other aircraft (see figure 5).

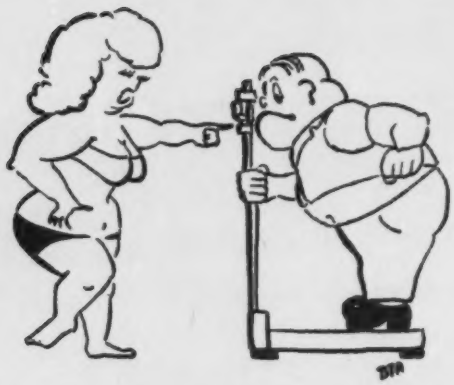
The most common mode used in air traffic control is the Beacon Assist mode. It stretches the return (see figure 6). Aircraft replying on other codes show only as single slashes. On all modes the ground radar will skin paint aircraft without transponders or those replying on another code.



Aircraft transponders perform an invaluable function in today's air traffic control system. They will be playing an even bigger role in the future when all aircraft and ground radar units will have altitude readout modes. Increased airborne transponder and ground radar technology, such as computerization, have increased the controller's ability to cope with aircraft control. It will be important for you to stay up to date on equipment changes and maintain your knowledge of what your actions in the sky do to the ground controller's radar displays.

Adiposity

Have you ever gone swimming and heard someone commenting about your funny inner-tube -- and you didn't remember bringing one? Maybe you need to see the Doc.



Dear Doc,

The other night my wife tried to get into last year's bathing suit to see if it would still fit. I'll admit I probably shouldn't have laughed as loud or as long as I did, but you wouldn't believe the things she said to me. She even had the nerve to challenge me to try on *my* old bathing suit and look at myself in a full length mirror. Well, to make a long story short, I did — and it was a pretty traumatic experience. I need help, Doc. How can I take off about 25 pounds in the next couple of weeks?

Chubby Crewmember

Dear Chubby,

To answer your question in the highly technical language of the medical profession: you can't. Weight reduction — especially if you need to lose more than five pounds or so — is a very touchy procedure that should only be attempted under the supervision of your local friendly flight surgeon. My advice to you is to go and see him. I'm sure he and his dietician friend will be glad to set up a program for you, including recommended diet and exercise. If you follow his instructions you can lose weight, but don't expect miracles. You didn't put on that excessive poundage overnight, and you're not going to get rid of it overnight either.

I would like to offer a little advice for your use after you've fought the battle of the bulge and won. Just because you managed to turn yourself back into the sleek male animal you were in your youth, don't quit working at it and go back to your old ways. You'll have to work to keep your weight under control. Here are some tips to help.

* Know your desired weight and keep track of how you're doing by weighing regularly; once a week at a set time works well.

* Don't skip breakfast. Breakfast should supply about 25 percent of your day's food requirements, and a good breakfast will help you keep from overeating at lunch.

* Watch between-meal and late-night snacks. If you do partake of some extra-curricular fat pills, skip dessert at lunch or dinner.

* Avoid cream, cream cheese, sugar and other sweets, nuts, and food prepared with a lot of shortening (sorry about that).

* Go easy on the extras. Don't take that extra butter, and pass up rich gravies, sauces, and salad dressings.

* Eat your meals slowly. This allows time for your blood sugar level to rise, which will make smaller amounts seem more satisfying.

* Avoid fried foods; choose things roasted, boiled, and broiled.

* Drink your coffee black — no cream or sugar. (You might want to give up coffee instead.)

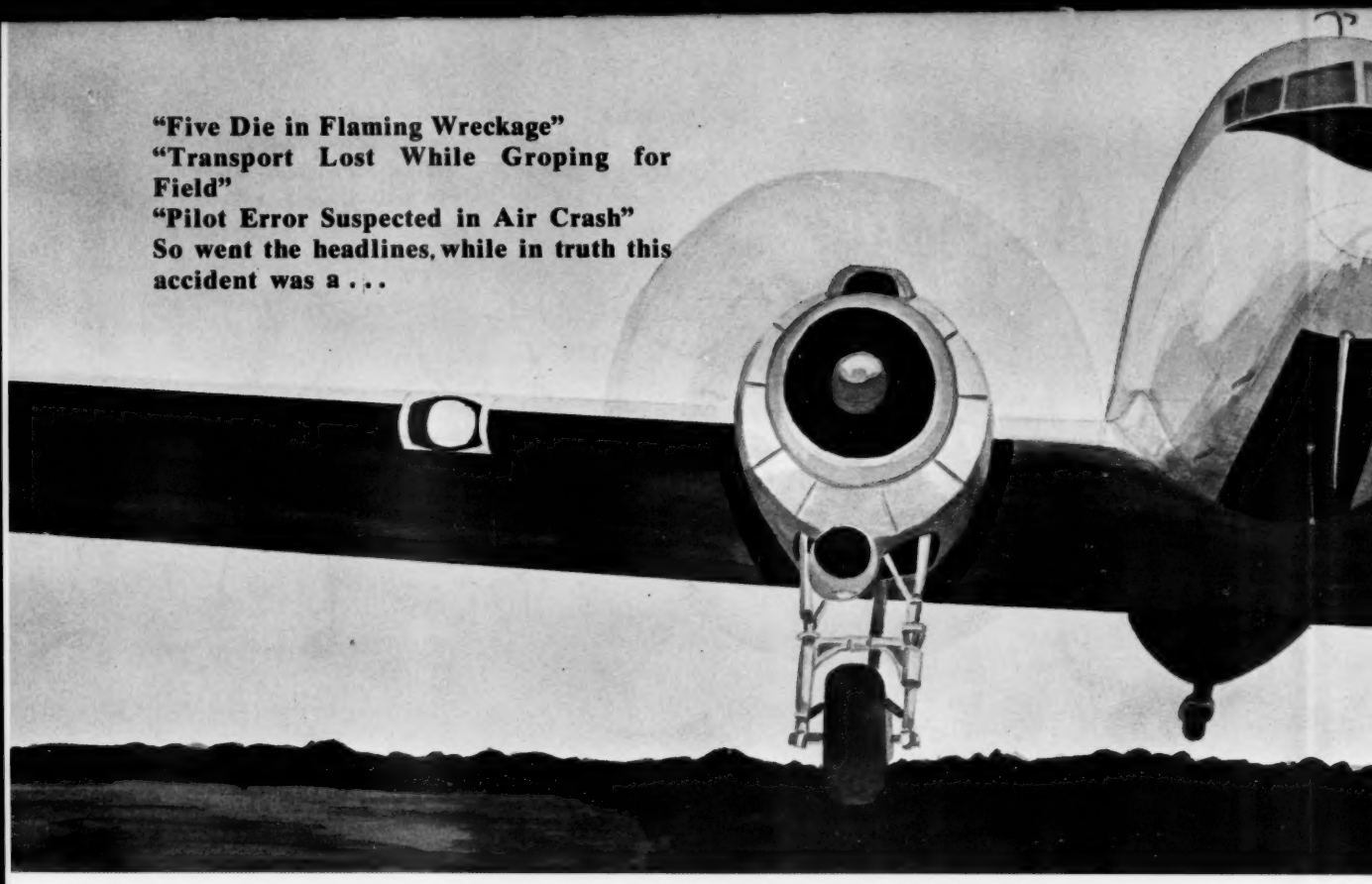
* Get some exercise every day. You don't have to run five miles before breakfast (though running is great, if you want to), but a reasonable amount of exercise — daily — is essential to maintain your best weight.

The only way to lose weight is to eat less and expend more energy. The flight surgeon can give you specific instructions that will do the job for you. After that, your goal should be weight control — not a zig-zag between losing and gaining. You'll feel better ... you'll look better ... you'll pass your annual flight physical ... and you'll probably live longer. When you think about it, that's a pretty good deal.

See ya around the system.

Doc

"Five Die in Flaming Wreckage"
"Transport Lost While Groping for Field"
"Pilot Error Suspected in Air Crash"
So went the headlines, while in truth this accident was a . . .



HERE, REDUCED TO ITS SIMPLEST TERMS, is the story: a twin-engine transport of mid-30s vintage crashed while the pilot was attempting an ILS approach in marginal weather. All five crewmen, the only souls on board, perished. The accident investigators could find no evidence of any mechanical or equipment failure which could have caused the accident. However, the investigators did establish that the pilots had failed to configure their aircraft properly for the approach, that they had descended in instrument conditions well below the authorized decision height for the approach, and that they had placed the aircraft in a position from which it could not be recovered. Consequently, the board settled on operator factor as the primary cause. Scratch one transport and five men, close the report, and move on to the next case.

As you probably suspect, this true story is oversimplified. But we didn't realize just how greatly it was oversimplified until we dug into the report.

Let's go back a few days before the Sunday of the crash.

The Beginning

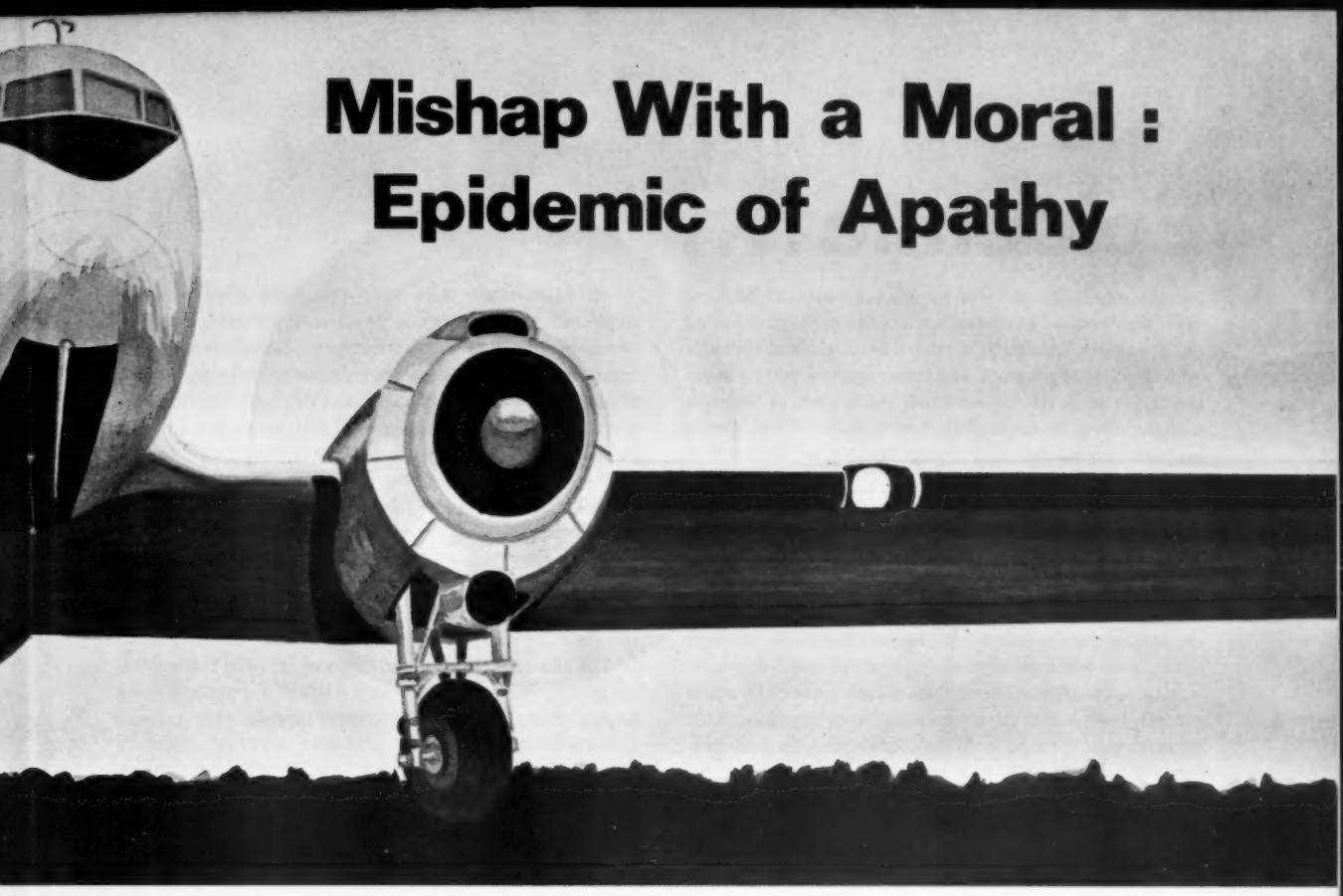
Early Thursday morning, Sgt Smith, the local support mission scheduler, called higher headquarters about a planned mission. While talking with Sgt Jones at headquarters, Sgt Smith learned that his organization might be asked to make two additional flights over the weekend. These were to be high priority missions; one would operate on Friday and the other on Sunday. After he hung up, Sgt Smith began trying to locate pilots for the missions — just in case.

About noon on Thursday, the flights were confirmed by a phone call from Sgt Jones. Sgt Smith planned the itineraries for the two missions and computed the crew duty days. The planned duty day for the Friday mission was over the 16-hour maximum and Sgt Smith called Sgt Jones about the problem. Sgt Jones explained that this was a "hot" mission; duty times would be extended if necessary. Sgt Jones offered no authority for the duty extension and Sgt Smith asked for none.

Normally, mission support flights in this organization were reviewed by supervisors during a monthly scheduling meeting. However, the add-on flights were merely written in without local review or approval. The telephone calls between the two sergeants were the extent of the command and control exercised during the planning of the missions.

Sgt Smith had had some difficulty manning the two missions, but by Thursday afternoon, he at least had a

Mishap With a Moral : Epidemic of Apathy



crew for the Friday trip. The aircraft commander would be Maj Johnson, Sgt Smith's supervisor, and the other pilot would be Maj Green, who needed 60-1 time. Sgt Smith located one pilot for the Sunday mission: Capt Barr, an attached pilot who was a qualified aircraft commander. Sgt Smith planned to use Capt Becker as the other Sunday pilot, but Capt Becker was TDY and not expected to return until Friday.

Late Thursday afternoon, Sgt Smith explained the situation to Maj Johnson and said that if he couldn't locate Capt Becker on Friday, Maj Johnson would have to fly the Sunday mission also. Sgt Smith told Maj Johnson he would leave word with the base operations dispatcher Friday night if Maj Johnson would have to fly again on Sunday. Maj Johnson agreed.

On Friday, Sgt Smith tried to locate Capt Becker but was unsuccessful. Finally, at 1700, Sgt Smith typed up a flight authorization for the Sunday mission, listing Maj Johnson as the aircraft commander. He also made up a mission folder and gave it to the base operations dispatcher with instructions to notify Maj Johnson that he would be needed for the Sunday trip.

The process of setting up the two missions did not create any dangerous conditions, but it did accurately reflect the casual attitudes of the people involved. They felt the missions needed no more than minimum supervision and planning. Mission support flying was left to function on its own — no one cared to be bothered with it.

The Friday Mission

Show time for the crew on Friday was 0730 local. Maj Johnson and Maj Green completed their mission planning, and their aircraft was airborne at approximately 0930.

The first leg of the flight was uneventful until just before landing. While in the flare, 10 feet above the ground and at 90 knots, the pilots felt the aircraft burble, as if it were trying to stall. Maj Johnson, in the left seat, added a little power and completed the landing. Both pilots commented about the burble and agreed that it was unusual for the aircraft to behave that way. Maj Green added that the aircraft did the same thing on a flight two days earlier, but he hadn't felt it was important enough to write up. Since the aircraft had been fitted with a VIP interior and was known to be unusually tail-heavy, the pilots decided that that may have somehow accounted for the strange burble.

The rest of the mission was uneventful and at ap-

Epidemic....

proximately 2320 the aircraft arrived back in the local area. The weather was reported as 300 feet overcast with 3 miles visibility in very light rain, winds light and variable.

Soon the crew was cleared for an approach, Maj Johnson flying from the left seat and Maj Green, in the right seat, handling all radio calls and checklists. Maj Green suggested some carburetor heat as they began the approach and Maj Johnson agreed.

Checklists were accomplished, then Maj Green reported procedure turn inbound. The aircraft was slightly left of the localizer center line as it crossed the outer marker locator. As Maj Johnson continued the approach, Maj Green noticed they were still drifting left and going slightly high on the glide slope. He mentioned the left drift to Maj Johnson, who applied a correction toward course, but the left drift continued. Maj Green mentioned again that they were left of the center line, but as he began to see lights through the clouds, he ignored the CDI and concentrated on looking for the approach lights. When Maj Green first saw the runway approach lights, they were approximately 40 to 50 degrees off to the right of the nose. He called, "Runway in sight," and Maj Johnson looked up, made an "S" turn to the runway, and landed.

Maj Green felt that Maj Johnson's problems during the approach were due to a slow cross-check and a lack of instrument flying proficiency. He did not consider them serious.

The Friday mission ended after a duty day of 16 hours and 40 minutes. No crew duty extension had been officially requested or approved.

The Sunday Mission

Early Sunday, local time changed from standard to daylight saving. This cost all crewmembers one hour of rest and contributed to some confusion later in the morning.

Show time for the Sunday mission was 0330 local, but at that time only Capt Barr arrived at base operations. By himself, Capt Barr completed the mission planning for the flight, which included filling out a self-briefing checklist, a DD-175, and a Form 365F. He also got a complete weather briefing for the planned round-robin with two en route stops.

Capt Barr commented to the base operations dispatcher that Maj Johnson had probably forgotten to reset his clock for the time change. At 0420, Capt Barr asked the dispatcher to call Maj Johnson, who apparently was home asleep.

At 0430, Capt Barr filed the flight plan with the dispatcher and went out to the aircraft parked in front of base operations. This was the same aircraft which Maj Johnson had flown on the Friday mission. After he arrived at the aircraft, Capt Barr completed the pilot's preflight inspection with the assistance of a maintenance man, and waited for Maj Johnson to arrive.

At 0440, Maj Johnson arrived at the aircraft, where he met Capt Barr and three other crewmembers going on the mission: a navigator and a medical technician both flying for time, and a crew chief who was not on flying status. The crew boarded the aircraft, started engines, and took off at 0518 — 38 minutes after Maj Johnson had arrived and only 18 minutes after the scheduled takeoff time.

The aircraft arrived at the first stop at 0918 and was on the ground for only 52 minutes while it was refueled and passengers were loaded. The second takeoff of the day was at 1110.

The next landing was at 1551. The passengers deplaned and the aircraft was reserviced with eight hours of fuel while the two pilots updated their weather information.

The latest observation at their destination was a partial obscuration, measured ceiling of 200 feet overcast, 3/4 mile visibility (varying from 1/2 to one mile), with light rain and fog. The forecast for their arrival time was for a prevailing condition of 100 feet obscured, 1/2 mile visibility in rainshowers and fog. Intermittent conditions would be 200 feet obscured with one mile visibility. Their alternate, one hour and thirty minutes flying time from their destination, would be 2,000 feet scattered variable broken, 3,000 feet broken, with 7 miles visibility and rainshowers in the vicinity. The two pilots were told to expect light icing in the clouds between 1,000 and 10,000 feet.

The pilots returned to their aircraft and started engines. As they taxied out, the transient maintenance men noticed that Maj Johnson was in the left seat and Capt Barr was in the right seat. The aircraft was airborne — on the last leg of the mission — after a ground time of approximately one hour.

Apparently, the crew experienced difficulty with the aircraft's interphone system during this flight. Later, the copilot's interphone selector switch was found in the interphone position. This would have kept Capt Barr from transmitting on the radio and was a switch position not normally used. Whether the positioning of the switch was inadvertent or due to some problem will never be known. In any event, initial contact with approach control and all subsequent transmissions were made by Maj Johnson.

On initial contact, approach control reported: "... sky partially obscured, measured ceiling 100 overcast, visibility one-half, light rain and fog. The runway visibility is more than 1-1/2 and the prevailing visibility is coming up ... Wind is 080 at 20 ... altimeter is 29.92 ..." The crew was cleared for an ILS approach to runway 26 (the only precision approach available, with published minimums of 200 feet and 1/2 mile) and told to expect an updated weather observation momentarily. Before they began the approach the crew was given a new weather observation of 200 feet overcast, 2 miles visibility in light rain and fog, winds 080 at 20, and runway visibility more than 1-1/2 miles.

The Approaches

Maj Johnson acknowledged the weather and began an approach. Shortly after the aircraft passed the outer marker inbound, the control tower operator advised that the runway visibility was decreasing again but was still one mile. Maj Johnson acknowledged, and moments later called missed approach.

Maj Johnson asked for and received clearance back to the outer marker locator for another approach. When he reported over the marker inbound he was advised that the winds had changed to 090 at 14, and the runway visibility had decreased to 3/8 of a mile. Moments later he was advised that the visibility had dropped to 1/4 of a mile, and seconds after that Maj Johnson called missed approach again.

After the second missed approach, Maj Johnson advised that he would like to hold and wait for the weather to improve a little before trying again. He was cleared back to the outer marker locator and told to report when established in the holding pattern.

The crew offered no reasons for the two missed approaches; however, there are several possibilities. The second approach was probably aborted because the last reported visibility was below minimums for the approach. Both approaches were conducted with a strong tail-wind component which would have required a high rate of descent to stay on the glide path. Additionally, in the type aircraft involved, it was normal to use no flaps while landing with a tail wind. Without flaps — and considering the rate of descent required to maintain the glide path — the approach would have been extremely difficult.

The weather conditions were so bad that people at the field did not see the aircraft as it made either of the missed approaches. However, several heard it and could judge its position by estimating the direction of the sound. This evidence indicated that the aircraft passed over, or very close to, the base operations building on both missed approaches — well left of the runway center line and in the same direction Maj Johnson had allowed the aircraft to drift while attempting an approach on the mission two days earlier.

The ILS installation at the field was fully operational; however, the localizer was unusable from the middle marker to the runway because of excessive left deviation. Normally, aircraft would be at minimums over the middle marker and the approach could be completed visually, but attempts to follow the localizer closer to the runway, or below minimum altitude, would put the aircraft left of the center line.

Base supervisory personnel were not told until after the second missed approach that the aircraft was back in the local area and attempting to land. When informed of the aircraft's presence, the supervisors requested information on the present weather, the aircraft's remaining fuel, and the alternate airport. After this information was passed, one supervisor considered going up to the tower and talking with Maj Johnson — but decided that would not be necessary. No other action was taken.

As the aircraft was making the second missed approach, weather service attempted to notify the control tower operators that the ceiling had dropped from 200 to 100 feet and the altimeter had changed from 29.92 to 29.91. Because of a problem with the telewriter alerting system, however, the control tower operators were unaware of this information and it was never passed to Maj Johnson and his crew.

Human Factors

When the crew began holding over the outer marker locator, they had been on duty for about 15 and a half hours. They had spent most of this time in the air, in a noisy aircraft with very high vibration levels, and had made two missed approaches in rough weather. Also, they had had little opportunity to eat, and knew they were expected to be at their regular jobs the next day. These conditions would produce fatigue, get-home-itis, apprehension, and hypoglycemia.

Aircrew fatigue is a nebulous thing. Predicting the precise amount or exact effects of fatigue for an individual under a given set of circumstances is virtually impossible. However, we do know that fatigue produces poor coor-

Epidemic....

dination, slow reaction times, and difficulty in concentrating. Fatigue can also influence speed and quality of decision-making.

The longer the duty day, the stronger the tendency for a man to look for the end of the task. This is one of the factors which produces "get-home-itis." In addition to furnishing a strong motivation for completing an approach and landing, this tendency makes the thought of another missed approach, and a flight to an alternate airport, unappealing. As with fatigue, it is impossible to determine how much effect this had on the crew's performance. It must be considered a factor.

Maj Johnson had made two missed approaches. The entire crew was aware that the weather at the field was marginal and that a landing might not be possible. These conditions would produce some degree of apprehension in the cockpit. It's another subjective factor, one which must have been present.

There was strong evidence that the crew had little or nothing to eat during the entire day, and lack of adequate meals would have done nothing to enhance crew performance. When Capt Barr arrived at base operations in the morning, the flight-line snack bar was closed and it did not open until after the aircraft had departed. Maj Johnson, because he was late, did not eat at home and was also unable to eat prior to takeoff. The two stops made during the day were both minimum ground time. While on the ground, the crewmembers may have gotten something to eat from vending machines, but there is no evidence that they took time to eat a regular meal. None of the crewmembers ordered or received a flight lunch during the day.

Other Factors

Weather conditions around the field were ideal for carburetor icing. The carburetor air heating system on the aircraft was operational, but it would not have been effective with the engines at the very low power setting necessary during an ILS no-flap approach with the tail wind that existed. Under these conditions, it would be possible for the carburetors to ice up enough to drastically reduce available engine power — without leaving any physical evidence of the ice or the power loss.

While holding in this aircraft, it is normal procedure to establish cruise configuration, including setting the propellers to cruise rpm and positioning the mixtures to auto-lean. When accomplishing the before landing checklist, the rpm would be increased and the mixtures reset to rich. However, the evidence indicated that the aircraft had been cruise configured while holding and the before landing checklist had not been reaccomplished. If the pilots attempted to set go-around power, with lean mixtures and cruise rpm, the engines would misfire and produce much less than expected power — probably insufficient power to maintain flight.

The Final Approach

The aircraft was held over the outer marker locator for 23 minutes. During this time, the control tower operator kept the crew advised of the runway visibility at the field. It was not improving much. The visibility stayed at about 5/16 of a mile but occasionally got up to 1/2 and then went back to 5/16. Finally, at 1830, the control tower operator advised that the visibility was up to half a mile and that there seemed to be a hole to the east of the field. He offered an approach clearance. Maj Johnson acknowledged and reported outbound in the holding pattern. While he was turning inbound he requested another approach and was cleared for an ILS. Winds were given as 090 at 23.

At 1835 Maj Johnson reported over low station inbound and was cleared to land. He was given a final wind of 090 at 16. There were no further transmissions from the aircraft.

The aircraft was seen breaking out of the overcast, near the end of the runway, at approximately 80 feet and heading roughly 45 degrees left of the runway centerline. The wings were level and the aircraft was in a slight descent.

From this position, the aircraft made a sharp descent to an altitude of less than 50 feet. Witnesses then reported a sudden increase in engine noise with sounds of backfiring and popping. At 15 to 20 feet above the ground the right wing went down and the aircraft hit on the right wing, landing gear, and engine. As the aircraft swung to the right, the nose of the fuselage slammed down heavily and parts of the aircraft flew off. The wreckage burst into flames as it skidded along the ground.

No, the simple review of the accident may present some of the facts — but, as this accident showed, there are usually many more. Typically, there's a large "supporting" cast which makes it very *possible* for the accident to happen. *Probable* would be a better term, especially when the entire organization is affected by an epidemic of apathy.

1972 Writing Contest

WINNERS

1st Place — 1st Lt Michael O'Neill, 18 MASq, McGuire AFB, NJ

2d Place — Capt Louis P. Gonzalez, 15 MASq, Norton AFB, CA

3d Place — Capt Dennis W. Stiles, 67 ARRSq, RAF Woodbridge, England

HONORABLE MENTION

Maj Gene Allen
137 AESQ (ANG), Will Rogers Fld, OK

Maj Garnett C. Brown, Jr.
438 MAWg, McGuire AFB, NJ

Lt Col Joseph A. Gagliano, USAFR (Ret)
452 MAWg (AFRES), Hamilton AFB, CA

Capt A. Thompson Oldham
55 WRSq, McClellan AFB, CA

Capt Tom Paton
4 MASq, McChord AFB, WA

Maj Grover C. Tate, Jr., USAFR (Ret)
Palmdale, California

Maj Charles G. Thomas
57 MASq, Altus AFB, OK

Lt Col F. E. Thompson
Det 4, MAC, Wright-Patterson AFB, OH

Capt Thomas E. Weimer
Det 3, 15 Wea Sq, Charleston AFB, SC

Misery is being badly injured and a hundred miles from nowhere. Happiness is hearing the "whop-whop-whop" of an ARRS chopper.

PROJECT MAST

by 1/Lt Ron Sconyers
ARRS/OI

KRIS KRISTOFERSON WAS on a prospecting trip as he maneuvered his jeep up a narrow, twisting mountain trail near Four Peaks, Arizona. Suddenly the left front wheel slipped off the edge of the trail and his jeep overturned, pinning him beneath it.

After struggling for what seemed like days, he worked his arms free and managed to reach his knife, then dug for three hours tunneling his way out. Once free, he crawled nearly five miles in the dark to a mountain road where he hoped he would be found. Late the next morning, a passing motorist spotted him and went for help.

The local sheriff arrived and realized immediately that Kristoferson was severely injured. The sheriff quickly determined that a landing site suitable for a helicopter could be cleared, and then contacted the base command post at Luke AFB. Soon, an HH-43 from Detachment 15, 42 ARRSq, lifted off the alert pad on the way to the pickup site.

The rescue team arrived at Four Peaks and found a small landing area marked out by the sheriff on the scene. The pilot maneuvered his trusty Huskie over the site and landed.

An Air Force medic, part of the rescue chopper crew, quickly evaluated the injuries: broken ribs and a possible broken back. He administered emergency first-aid to the miner and placed him on a litter, and the rescuers flew him to a civilian hospital in Mesa, Arizona. The doctors there said that Kristoferson's condition was critical and he would have died without the detachment's quick reaction and immediate evacuation.

Those few words, "without quick reaction and immediate evacuation," are the key to the story. Since July 1970, the Department of Defense has participated in a program using military helicopters to respond to civilian medical emergencies when time is critical and no other civilian resources are available. The program, known as MAST (Military Assistance for Safety in Traffic), began at Fort Sam Houston, Texas, and was later expanded to Fort Lewis, Washington, and Fort Carson, Colorado. Two 42d ARRSq units, Det 15 at Luke and Det 22 at Mountain Home, were also charter MAST participants.

The initial test was to determine if military resources could augment existing civilian emergency medical service systems. This program was evaluated by Ohio State University's Department of Preventive Medicine and by the Stanford Research Institute. Both agencies recommended that the program be continued on a permanent basis. On 3 Feb 1972, Secretary Laird announced that the Department of Defense would expand MAST coverage and participation, with Aerospace Rescue and Recovery Service to carry out the program for the Air Force. The expanded program would be conducted only in selected, predominantly rural and remote areas where adequately equipped civilian helicopters and medical personnel are not readily available.

The MAST program originally provided medical care only to highway accident victims, but it now has been expanded to respond to any type medical emergency. In the first eighteen months, the 15th and 22d detachments have chalked up nearly 50 missions in which more than 130 civilians have been assisted or saved.

How do isolated areas get MAST assistance? A community wanting to participate in the program must request it from the Department of Defense through their local military installation. The community must show that it meets certain criteria (such as the lack of similarly equipped rescue vehicles and trained personnel) and must agree to provide communications between local medical facilities, law enforcement agencies, the supporting military facility, and the aircraft. It must also provide heliports at local civilian hospitals. (If a civilian operation capable of providing the same quality and level of service is later established, the MAST operations may be ended.)

Once an area is selected as a MAST site, military people meet with local officials to provide the necessary guidelines and criteria for requesting each MAST mission. These meetings are held periodically to update mission requirements and to maintain a close working relationship between military and civilian rescue personnel. A lot of responsibility rests on the local rescue personnel.

A MAST mission request can only be made by a law enforcement officer on the scene who has evaluated the patient's condition. He must determine that there is danger of loss of life or that the illness will be severely aggravated without prompt medical attention. He also must determine that a suitable landing zone is available or can be cleared. Then he contacts the base command post at the participating military installation and requests assistance.

The area which any one helicopter base can service can be 25,000 square miles or more. ARRS helicopters normally operate within a one-hour flying radius of their bases (80-100 miles). However, some units have prepositioned fuel at strategic locations so they can extend this range if necessary.

MAST is not just a rapid transportation system. Its primary purpose is to provide competent medical care to a person in medical need and to maintain the proper level of care until the patient is delivered to a capable medical facility. The combination of Air Force medics and ARRS rescue crews provides this capability.

People like Kris Kristoferson, or the 7-year-old girl who broke her back when she fell off her horse, or the six people who were critically injured in a head-on collision, or the 17-year-old boy who fell while trying to scale a cliff, have all expressed their deepest thanks to Det 15 and 22 and the MAST program. They know first-hand that the MAST program and the people who make it work truly contribute to Aerospace Rescue and Recovery Service's philosophy that no man is expendable. This program exemplifies the ARRS motto "That Others May Live."

Ah, yes -- what grand things result when modern technology is put to new, exciting uses by the Man with the Golden Mouth.

C.R. TERROR

THE BASE OPS DISPATCHER stared disconsolately at the door to the flight planning room, then turned his gaze back to the obviously upset captain across the counter. "Sorry, sir," he offered, "but the major in there from ACGS told me he couldn't be disturbed. Said him and his crew were workin' on a classified project, and no one was to come in. I can lend you a couple of charts out of a trip kit, if that will help ..." His voice trailed off as the unhappy pilot threw up his hands and voiced a quaint expletive commonly heard in and around stockyards.

On the other side of the shut and barricaded door, the Aerospace Ace and his green-garbed gang were hunched over a table. All eyes followed the pencil clutched in the Pontiff of Plotting's chubby paw as it flitted across a topographic map. The Great One was speaking.

"Okay, troops, here's the IP — we'll hit it at 1410 local. Solid sunshine forecast — and a nice sun angle, too. Then we'll take up a heading of west, still at 2,000 feet, and as soon as we hit the tree line here we can start descent. Notice the whole section here is wet bottom lands and swamp. No one lives here 'cause the river floods it every year, so we can drop to 200 feet and not bother anyone. Where these dirt tracks cross, we'll turn right and head 355 degrees toward the bend in the river. Got that?"

He paused to glance around the circle, noted the nods, then continued. "Okay, when we hit that bend, we'll have this cliff and all these woods on our left, and the town is still a couple of miles away to the north. As soon as we pass the shoal at the bottom of the cliff, we turn left to 342 — *exactly* 342, got that, Blinky? — and then drop to 100 feet. Precisely 27 seconds after the shoal we turn to 295 and turn on the cameras. Five seconds later — Sam, back me up on the count — we go to max power and make a 2-g chandelle back to the south. We climb out over the woods and vanish toward Pyrite Air Patch. Down the road a piece, we turn east again and come home. Film processing will begin right after we land. Now, are there any questions?"

"Yeah, chief," queried Blinky, "do you think we can pull it off without being spotted?"

"No, not really. Instead, I'm betting that anyone who sees us will think we're some of the Yahoos from Pyrite out having a little fun."

"Sure boss," chimed in Sam, "but *any* dummy can tell we've got an A model and they're flying E-types."

"Unh-uh, Sammy, and that's one of the things you've got to keep working on. You'll never be an AC

until you think better. Most of the local dummies will have a hard time deciding if we've got more than one engine. You ever talked to witnesses after an accident and seen how bad they get things fouled up?"

"Okay, chief, you got me on that one."

"Yeah, meathead, and I'll get you on another one, too, if you don't get out to the bird and check the settings on both cameras. This run will be a lot lower and faster than we usually fly, and I don't want any foul-ups. We'll only get one chance — and it's the chance of a lifetime."

***

The sleek turboprop rolled to the left and picked up the new 342 heading as the shoal passed the left wingtip. Blinky punched his hack watch and Sam backed him up with his Glyrice Oarman. "Turn ... *now!*" Blinky commanded as the sweep hand touched 27. C. R. called for cameras on as he cranked the bird left to 295, then rolled out, counted to five under his breath, and stiff armed the power levers. "Hang on!" he exclaimed as he yanked the bird up and to the left, "and awayyyyyyy go-o-o- ..."

Sam glanced across the cockpit to catch one last glimpse of the acre of startled pulchritude — and suddenly noticed a radio tower looming ahead of their left wing. "Look out, chief!" he bellowed, banging down on the right side of the yoke and causing a healthy lurch.

"No sweat, Sam; we missed it by over a hundred feet," the Portly Prince soothed. Then his expression changed. "Hey — that tower wasn't on the map. Things like that could cause accidents."

"Yeah," chimed in Blinky, "and we can't even send in a hazard report."

Less than two hours after landing, C. R. and cronies were hunched over prints still damp from processing. "Man, oh, man," enthused the Caliph of the Cameras as he peered through the stereo viewer at the rounded images. "Lookit that little lovely in the polka dot jobbie. And *that* one — in the topless. Oh, wow!" He grabbed another pair of pictures from the pile and adjusted them under the viewer.

"I'll have to hand it to you, chief," Blinky observed. "I didn't think those cameras would work that well at low level. And you sure picked a good occasion to test the idea — imagine, stereoptical photos of senior week at that girls' college, and sunbathers all over the place. 'Course, a nudist camp would have been better but we'd never have gotten the prints back from the lab guys. Yeah, I've got to hand ..."

His comments were cut short as the door flew open and the Aerial Survey Team commander burst into the room. *"I'll* hand it to you alright, Terror," roared the excited lieutenant colonel. "And here it is. How do you explain this?"

The Quaking Quixote gingerly took the paper from his boss and read the message, neatly handwritten by the unit's secretary. "Pyrite AFB CO wants to know if we own A/C 00666. A/C buzzed girls' colg. — hit guywire on radio tower. OSI, JAG, AFISC notified. Reply ASAP."

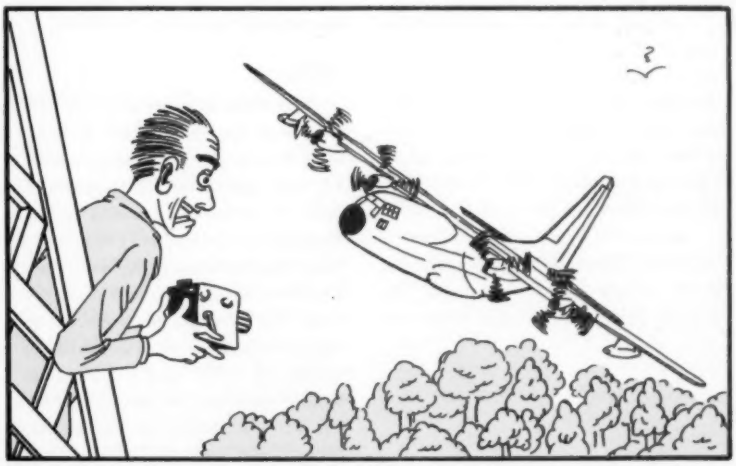
"Whatever made you think we had anything to do with that?" C. R. blustered.

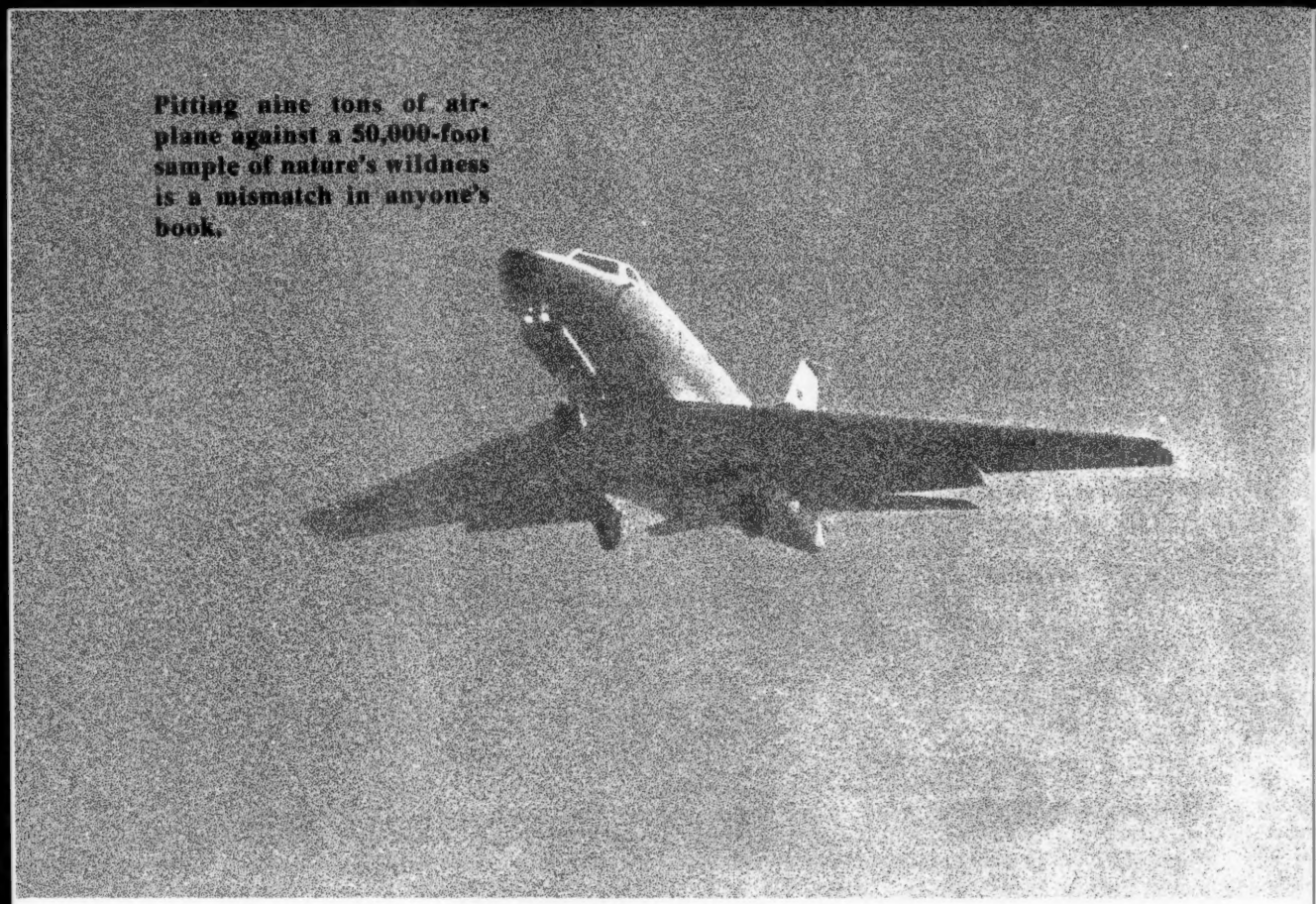
"I'll give it to you simply and maybe your limited intellect can keep up with me," the boss needled. "First, we *do* own 00666. Second, you flew it today. Third, it has a bad cable cut exactly six inches in from the left wingtip. Enough?"

"Circumstantial evidence at best, sir," C. R. protested.

"Are you ready for the clincher? One of the local news photographers apparently had the same idea you had — no, don't try to kid me; I've seen some of those pictures young Donovan is trying to hide — and this guy was up in the crow's nest on the radio tower trying out a very long lens. He heard you coming up the river and took a couple of shots. He wouldn't have done a thing with them until you cut that guy wire and scared the bejabbers out of him. From then on, you were on his list, so he called the nearest base. That's how the Pyrite honcho got the tail number. He just happened to be an old mapper and trapper and remembered triple six as one of our birds. *Now,* what do you have to say?"

While C. R. made like a choking carp, Blinky turned to Sam. "Looks like we can submit the hazard report on that tower now, doesn't it?"





Pitting nine tons of airplane against a 50,000-foot sample of nature's wildness is a mismatch in anyone's book.

A Very Uneven Contest

FIRST, MARK OFF one standard parcel of sky, skewered neatly on a jet airway. Then add a typical thunderstorm, heaped to at least 41,000 feet. All your concoction lacks is a teenie training transport, nomenclature T-39A, so throw one in. Now, shake like crazy and watch what falls out the bottom. That's right — the teenie.

Seems like every year we have at least one of these mismatches, and the T-39 always seems to come out second best — or worse. From our flight safety files we've drawn these two classic cases.

One

The flight originated in the southwest and was bound for a western base. The weather for the first hour at FL 350 had been pretty good. The crew saw something brewing up ahead and queried the center. They were advised that the airway they were on was cluttered but an adjacent airway was clear. The IP requested a reroute and, once established, he also asked for a climb. FL 390 didn't look like it would quite do, so center approved FL 410. The aircraft was suddenly flung to 45,000 feet, and center approved the crew's prompt request for a FL 450 clearance.

The T-39 had been at 450 in thin cirrus clouds a short time when turbulence and technique combined to drop the airspeed to 160 knots, whereupon one engine, then the other flamed out. After experiencing a series of unusual attitudes and a pair of fires during the restart attempts, the crew finally got things stabilized — if not under control — with an airstart on one engine at FL 210. Now, to

compound the troubles, they learned that center could not provide vectors to a suitable field — because the center radar had been hit by lightning and was down. The crew took a deep breath, found a usable VOR facility, and made their way to a civilian field for a sporty, hydroplaning, ground-loop landing that cost a pair of tires and wheels.

Two

This crew was eastbound across the expanses of the great plains at FL 370. Thunderstorms loomed ahead, and the IP asked for a clearance to FL 410 plus permission to deviate from course. Soon he changed his altitude request to FL 430 and asked for a radar vector back to course; apparently he figured the only way home was to have center radar pick a hole through for him. The T-39 was pointed through what appeared to be the lightest area and quickly entered a cirrus layer.

Almost immediately they encountered moderate turbulence, and the crew slowed to turbulence penetration speed. They were hit by a sudden severe jolt of turbulence, then both engines flamed out. As the investigator observed quaintly, the loss of thrust caused the aircraft to descent into severe thunderstorm activity.

Here again, numerous airstart attempts were futile, producing only an engine fire. As the bird sank through 10,000 feet, the pilots spied lights on the ground and, aided by Mother Nature's flare service (lightning), the crew planted the bird in a cornfield.

Alike

What were the similarities in these cases? First, both missions were under the command of an IP. Second, there seemed to be some pressing need to accomplish the mission — one crew was homeward bound from a training flight and the other was carrying some passengers in a similar direction. Third, both flights were being operated in the FL 350, high-engine-sensitivity range, and both birds climbed to near the top of the aircraft's performance envelope. Fourth, both were in cirrus clouds when they plowed into turbulence, and both suffered dual engine flameouts. Fifth, immediate restart attempts produced either fire indications or actual fires. Sixth, from the no-power position there was no way to go but down — into the cauldron of Thor. And seventh, though it is only a curiosity, both occurred on a Tuesday.

Cures

A number of recommendations came from these mishaps, some very rudimentary and some very expensive. None was really original.

* Stay out of thunderstorms. A brief (though uniquely worded) bit of advice from the Dash One: "The potential danger of thunderstorms is statistical history. Never enter them by choice." Considering this, it's interesting to note that MAC T-39s play footsie with bumpers nearly a thousand times during the season — and manage, by one estimate, close to a hundred penetrations of one degree or another.

* To stay out of thunderstorms you've got to see them, and that means either using radar or staying in visual conditions. Incidentally, every time a T-39 gets stung by a thunderstorm, one of the recommendations involves getting and using airborne radar. But don't hold your breath on that one — MAC is only on the list for two radar-equipped T-39s. The only option, then, is to follow the advice of the MACSUP to AFM 60-16: "MAC aircraft will not be operated into ... areas of known or forecast thunderstorms without an operational airborne radar unless the weather forecast indicates that the IFR flight can be conducted through the area visually."

* When you blunder into a thunderstorm, set your airspeed *once* at 225 or .74, then fly attitude. Don't change trim settings, don't use sudden or extreme control inputs, don't chase the altimeter, and don't change the thrust you've set for best penetration airspeed unless you encounter an extreme and hazardous speed variation.

* Know your engines. Adverse weather can cause surge and flameout due to airflow disruptions. Above FL 350, maintain at least 180 knots and adjust throttles — gently — one at a time. That rule is true only in stable air; in heavy turbulence even at 225 knots your engines may be equally sensitive or worse. Also, if airflow at cruise rpm is so erratic that it causes a flameout, you probably won't have enough air to get a good start — and you stand a good chance of causing a fire. As the book says, "For flights above 29,000 feet, if immediate corrective action is not taken, a relight ... is unlikely."

* Know your electrical gear. One investigator recommended using VHF instead of UHF after a dual flameout because of the lesser electrical demands. Try to stretch the 45 minutes of battery life the Dash One provides you.

For a pithy summary, consider the plight of Tennyson's famous Light Brigade.

"Cannon to the right of them,
Cannon to the left of them,
Cannon in front of them
Volley'd and thunder'd."

They pressed on — and suffered grievous injury. Had they cancelled the mission, they'd have lived to fight another day.

Nature's cannon deserves the same respect.

Smoke Gets In Your Eyes...

Loss of night vision is an important but often overlooked problem caused by cigarette smoking. Briefly, the carbon monoxide in cigarette smoke combines with hemoglobin and reduces the blood's oxygen-carrying ability. As you probably remember from your last chamber flight, eyes are one of the first things affected by low oxygen levels. Smoking three cigarettes just before takeoff can reduce your night vision as much as the effect of 8,000 feet of altitude.

Compared to a heavy smoker's other problems, this partial loss of night vision probably isn't too important — but it does exist and is another reason to kick the habit. If you haven't done so yet, remember there is one sure way — cancer cures smoking.

(4500 ABWg Safety Newsletter)

Controller Confusion

Proper identification in a radar environment is a must. After all, misunderstanding between pilot and controller could change your whole future. This first person account by a civilian pilot is a case in point.

"I was inbound to the airport, in the soup, when I was switched over to approach control. Approach control said, 'Ident. Descend to 4,000, call level.' About five minutes later we called, 'Level at four' and approach control immediately came back with, 'Descend to three thousand.' No flight identification preceded their transmission but they came back so quickly after our call that we assumed it was for us, so we called, 'Out of four for three' and continued our letdown to 3,000 feet. No 'Roger' from approach control! About five minutes later, approach control advised, 'Traffic eleven o'clock, six miles, level three thousand, slow speed. You'll pass over him.' We came back, 'Roger we're on instru...BUT WE'RE AT THREE!' 'You are? Then turn left 180 degrees.'

"You probably have guessed what happened. Approach control cleared the guy ahead of us to three thousand just as we keyed the mike to call, 'Level, four.' Thus, our transmission blocked the flight identification part of the clearance, and when we let up on the mike key it was just in time to hear the last part of the descent clearance. The controller didn't hear our 'Out of four for three,' because one of us was on UHF and the other on VHF and the other guy was closer in, saying essentially the same thing."

(Iowa Aviation Bulletin)

Berlin Recap

This month marks the 25th anniversary of the beginning of the Berlin airlift. During that massive operation, which lasted over a year, we flew almost 200 aircraft on more than 266,000 missions, delivering a total of 2,325,000 tons of supplies to the beleaguered city. Today, we could do the job with only 46 C-141s or 13 C-5s.

Melted Mask?

In an emergency, your personal oxygen mask can be a lifesaver, but if it's to do its job, you must give it tender loving care the rest of the time. That TLC should include protection from excessive heat — which can severely damage your mask. We know you wouldn't store your mask in an oven, but the trunk of your car can get almost as hot as an oven, and that's where many crewmembers keep their oxygen masks. Remember, you may need your mask only in an emergency, but your masks needs you — all the time.

MSgt Richard C. Manning,
MAC Life Support

Stranger Than C.R.

Normally, C. R. Terror's adventures are loosely based on fact with one or more details exaggerated to make a point. His escapades are fiction — but recently, we've seen a couple of C. R.'s tales come true!

In April 1971, the rotund one slid off the runway at an Army field and had his aircraft pulled out of the mud by tanks. After the story appeared in print, we ran across a report in another magazine showing a civilian airliner, which had gone off the side of a runway, being pulled onto the pavement by — you guessed it — an Army tank!

In our April '72 issue, C. R. did the impossible again as he lost all four engine-driven generators in a C-141. His problem was compounded when, because of altitude, all four engines flamed out. After the story was written we saw not one, but *two* incident reports of the loss of all four generators in a C-141. Fortunately, in both cases, the aircraft were low enough so the engine driven fuel pumps could draw fuel and none of the engines flamed out.

It kinda makes us wonder. Maybe we're not exaggerating enough.

It's Happened Before

A C-141 landed at a Navy base to pick up a load destined for Southeast Asia. The loadmaster checked the cargo and manifest carefully, and even went so far as to ask the shipper if the weights shown were gross pallet weights. He was assured they were.

The loaded aircraft departed on the next leg of the mission. While climbing out, the aircraft's performance seemed a little sluggish, and during cruise the target EPR would not hold .767 mach. Suspecting an error in the cargo weight, the crew requested the cargo be reweighed after arriving at Elmendorf. Sure enough, the load was 4,897 pounds heavier than it should have been — an error of better than two tons!

It turned out that some extra cargo had become available as the pallets were being made up. The extra cargo was packed on the pallets but never entered on the manifest; the pallet weights were not changed to show the extra weight.

There's not a lot a crew can do to protect themselves from this sort of thing — except perhaps to have a healthy skepticism of all load weights. Often load errors are apparent; sometimes — as in this case — they aren't. Just be sure you find the ones that can be found.

after deadline.....

THAT'S A NICE PHOTO-- We recently ran across this unusual C-5 photo, by SSgt Victor R. Maynard of AAVS' Det 1, in the Scott Photo Lab. He did not know we needed pictures, and we did not know we had such a source at hand. How many others have favorite aircraft or aircraft related photographs you'd like to share with readers of your safety magazine? Our address is on pg 2.

BUT NOBODY KNOWS WHY -- or so we said in the April "Squawk Box," where we observed that crew buses at one base pull up with the entry door away from the aircraft. Our note reflected our experience that this was the exception rather than the rule, but we were sure taken to task -- it seems that the only safe and proper way is for the driver to keep his side of the bus toward the aircraft. We received more mail about that one column than we have for the last six issues put together. Here are some of the comments:

* Base ACP Chief: "Some of us know the reason why. The crew bus at Hickam is required to observe the circle of safety. If the entry door is not away from the aircraft, there has been a safety violation."

* Safety Officer: "We are shocked with your statement. Your answer is in AFM 77-2, para 26-3a, 'CAUTION: All vehicles must approach parked aircraft with the driver's side toward the aircraft.' Please tell the world."

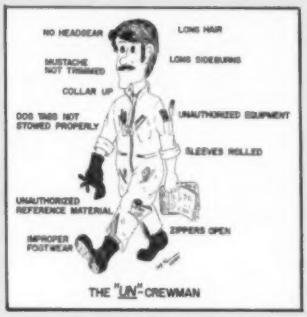
* Vehicle Spotter: "See AFP 77-2-1, Motor Vehicle Operators Handbook: 'All vehicles must approach parked aircraft with the driver's side toward the aircraft.'"

* Non-MAC Safety NCO: "You'd know why if you checked AFM 77-2, page 26-2. The driver's side must be toward the aircraft."

* Interested Bystander: "This letter may answer your question, 'Is anybody out there?' Yes, we are -- and we like to sound off once in a while."

Did we ever get the message! Thanks for letting us know you are reading TMF, editorials and all. And please be on the lookout for similar clangers in this and future issues.

BIRDS OF A FEATHER -- Some sharp troops in 21 AF Standardization did a double take at the Uncrewman and Fanny Flyer, who appeared back-to-back in April. Seems they couldn't help noticing the remarkable similarity. To prove their point, they sent us a neatly colored copy of the two drawings, noting that every single goof by the Uncrewman was mirrored by Fanny. We presume that similar copies were prepared and posted in appropriate places at McGuire. Good job, guys. And now, will all who object to Fanny please let us know?



A WORD FOR FLEET SERVICE -- The April "Squawk Box" kicked off another furor concerning fleet service and aircraft uncleanliness, and it seems that complaining crewmen may have no one but themselves to blame. According to one headquarters source, MAC Form 79, "Aircraft Interior Cleaning Check List," must be completed and signed by the aircraft commander or his designated representative before each takeoff. In it there is this statement: "I certify that I have inspected the cleaning and servicing indicated above, that it is complete and satisfactory."

Obviously, someone on the crew found things satisfactory. We plan to cover this in more detail in a future issue. To balance the "how it ought to be" picture, let's hear from crewmen who have had dirty airplane troubles.

* * * * *

COMING ATTRACTIONS -- The July issue of TMF will feature: a mishap caused by a comm snafu, a recap of an in-flight lightning strike to a helicopter, and C. R. Terror's forgotten lesson from the summer of '42.

the ANALYZER

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